

CLAIMS

1. A method of managing resources in a switched network comprising the steps of:-

- 5 (a) assigning a respective WtP value to each of a plurality of network users,
- (b) assigning respective set point values for a network performance parameter for each of a plurality of routers in the network ,
- (c) assigning a respective initial price value to each router which is associated with the network performance parameter at the router, and
- 10 (d) operating a first control loop which is operable to:-
 - (i) receive respective measures of the actual network performance at each of the routers,
 - (ii) calculate for each router, a plurality of difference values which are the respective differences between the actual performance and the set point for each router,
 - 15 (iii) adjust the price value for each router by a factor based on the respective difference value,
 - (iv) generate a flow price value for each user by combining the price values for each of the routers in the path of the respective user's desired data flow through the network,
 - 20 (v) allocate a resource share value for each user which represents the value of the respective WtP value taking account of the respective flow price value, and
 - (vi) cause the ingress router for each user to restrict flow into the network ingress from each user in accordance with each user's allocated resource share value,
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whereby the actual network performance at each router is made to converge to the set point value for the respective router by automatic admission control adjustments at the network ingress routers.

30 2. A method according to claim 1, wherein the WtP value for each user is associated with user bandwidth requirements, the price values are associated with bandwidth usage at each router and wherein the control loop is operable to receive measures of bandwidth usage at each router.

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3. A method according to claim 1, wherein the WIP value for each user is associated with user QoS requirements, the set point values are associated with QoS parameters at each router, the price values are associated with QoS at each router and wherein the control loop is operable to receive measures of QoS at each router.

4. A method according to claim 1, including assigning respective second set point values for a second network performance parameter for each of a plurality of routers in the network, assigning a respective initial second price value to each router which is associated with the second network performance parameter at the router, and further including operating a service manager operable to monitor the said convergence of the actual network performance with the set point network performance and to provide a provisioning potential value to a second control loop, the second control loop being operable to

(vii) receive respective measures of the actual second network performance parameter at each of the routers,

(viii) calculate for each router, a plurality of difference values which are the respective differences between the actual second network performance parameter and the second set point for each router,

(ix) adjust the second price value for each router by a factor based on the respective difference value,

(x) generate a second flow price value for each user by summing the second price values for each of the routers in the path of the respective user's desired data flow through the network, and

(xi) allocate a second resource share value for each user which represents the value of the respective provisioning potential value divided by the respective second flow price value,

the ingress router for each user being caused to restrict flow into the network ingress from each user in accordance with each user's first and second allocated resource share values, whereby the actual network performance at each router is made to converge to the first and second set point values for the respective router by automatic admission control adjustments at the network ingress routers.

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5. A method according to claim 4, wherein the WIP value for each user is associated with user QoS requirements, the set point value is associated with QoS at each router, the price values are associated with QoS at each router and wherein the first control loop is operable to receive measures of QoS at each router.
6. A method according to claim 4 or 5, wherein the provisioning potential value for each user is associated with user bandwidth requirements, the second set point values are associated with bandwidth usage at each router, the second price values are associated with bandwidth usage at each router and wherein the second control loop is operable to receive measures of bandwidth usage at each router.
7. A method according to claim 1, wherein the price value is adjusted in the control loop by a factor which is the product of the difference value and a number in the range 0.1 to 0.2.
8. A method according to claim 4, wherein the price value is adjusted in the control loop by a factor which is the product of the difference value and 0.16.
9. Admission control apparatus for a switched network having a plurality of routers, the apparatus being arranged to:-
- (a) record a predetermined respective WIP value for each of a plurality of network users, each of the users being coupled to the network via an Ingress router,
 - (b) record respective predetermined set point values for a network performance parameter for each of a plurality of routers in the network, and
 - (c) to assign a respective initial price value to each router which is associated with the network performance parameter at the router, and
- the apparatus comprising loop control means operable to:-
- (i) receive respective measures of actual network performance at each of the routers,
 - (ii) calculate for each router, a plurality of difference values which are the respective differences between the actual performance and the predetermined set point for each router,

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(iii) adjust the price value for each router by a predetermined factor based on the respective difference value,

(iv) generate a flow price value for each user of the network by combining the price values for each of the routers in the path of the respective user's desired data flow through the network,

(v) allocate a resource share value for each user which represents the value of the respective WTP value taking account of the respective flow price value, and

(vi) cause the ingress router for each user to restrict flow into the network ingress from each user in accordance with each user's allocated resource share value,

whereby the actual network performance at each router is made to converge to the set point value for the respective router by automatic admission control adjustments at the network ingress router.

10. Computer software which when executed, operates to manage resources in a switched network by performing the steps of:-

(a) assigning a respective WTP value to each of a plurality of network users,

(b) assigning respective set point values for a network performance parameter for each of a plurality of routers in the network ,

(c) assigning a respective initial price value to each router which is associated with the network performance parameter at the router, and

(d) operating a first control loop which is operable to:-

(i) receive respective measures of the actual network performance at each of the routers,

(ii) calculate for each router, a plurality of difference values which are the respective differences between the actual performance and the set point for each router,

(iii) adjust the price value for each router by a factor based on the respective difference value,

(iv) generate a flow price value for each user by combining the price values for each of the routers in the path of the respective user's desired data flow through the network,

(v) allocate a resource share value for each user which represents the value of the respective WTP value and takes account of the respective flow price value, and

(vi) cause the ingress router for each user to restrict flow into the network ingress from each user in accordance with each user's allocated resource share value,

whereby the actual network performance at each router is made to converge to the set point value for the respective router by automatic admission control adjustments at the network ingress routers.

12. Admission control apparatus for a switched network, the apparatus being arranged to monitor a first network performance parameter in relation to a first setpoint value and to adjust a first pricing value based on the convergence of the network performance to the first setpoint value and on a first willingness to pay parameter, the apparatus being further arranged to monitor a second network performance parameter in relation to a second setpoint and to vary the bandwidth admitted at an ingress of the network based on the convergence of the network performance to the second setpoint value and on the first pricing value whereby the network performance is made to converge to the first and second set point values by automatic admission control adjustments at the network ingress router.

13. A telecommunications network including admission control apparatus for a network being arranged to:-

(a) record a predetermined respective WTP value for each of a plurality of network users, each of the users being coupled to the network via an ingress router,

(b) record respective predetermined set point values for a network performance parameter for each of a plurality of routers in the network, and

(c) to assign a respective initial price value to each router which is associated with the network performance parameter at the router, and the apparatus comprising loop control means operable to:-

(i) receive respective measures of actual network performance at each of the routers,

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- (ii) calculate for each router, a plurality of difference values which are the respective differences between the actual performance and the predetermined set point for each router,
- (iii) adjust the price value for each router by a predetermined factor based on the respective difference value,
- (iv) generate a flow price value for each user of the network by combining the price values for each of the routers in the path of the respective user's desired data flow through the network,
- (v) allocate a resource share value for each user which represents the value of the respective WTP value and takes account of the respective flow price value, and
- (vi) cause the ingress router for each user to restrict flow into the network ingress from each user in accordance with each user's allocated resource share value,
- whereby the actual network performance at each router is made to converge to the set point value for the respective router by automatic admission control adjustments at the network ingress router.

12. A dynamic resource control network wherein a network operator controlled entity, rather than the user itself, determines willingness to pay associated with user traffic, responsive to resource pricing information provided from traffic routing nodes in the said network.
13. A method of managing a dynamic resource control network wherein a network operator controlled entity, rather than the user itself, determines willingness to pay associated with user traffic, responsive to resource pricing information provided from traffic routing nodes in the said network.
14. Software on a machine readable medium for managing a dynamic resource control network wherein a network operator controlled entity, rather than the user itself, determines willingness to pay associated with user traffic, responsive to resource pricing information provided from traffic routing nodes in the said network.